



36936000022049

I walk in the rain



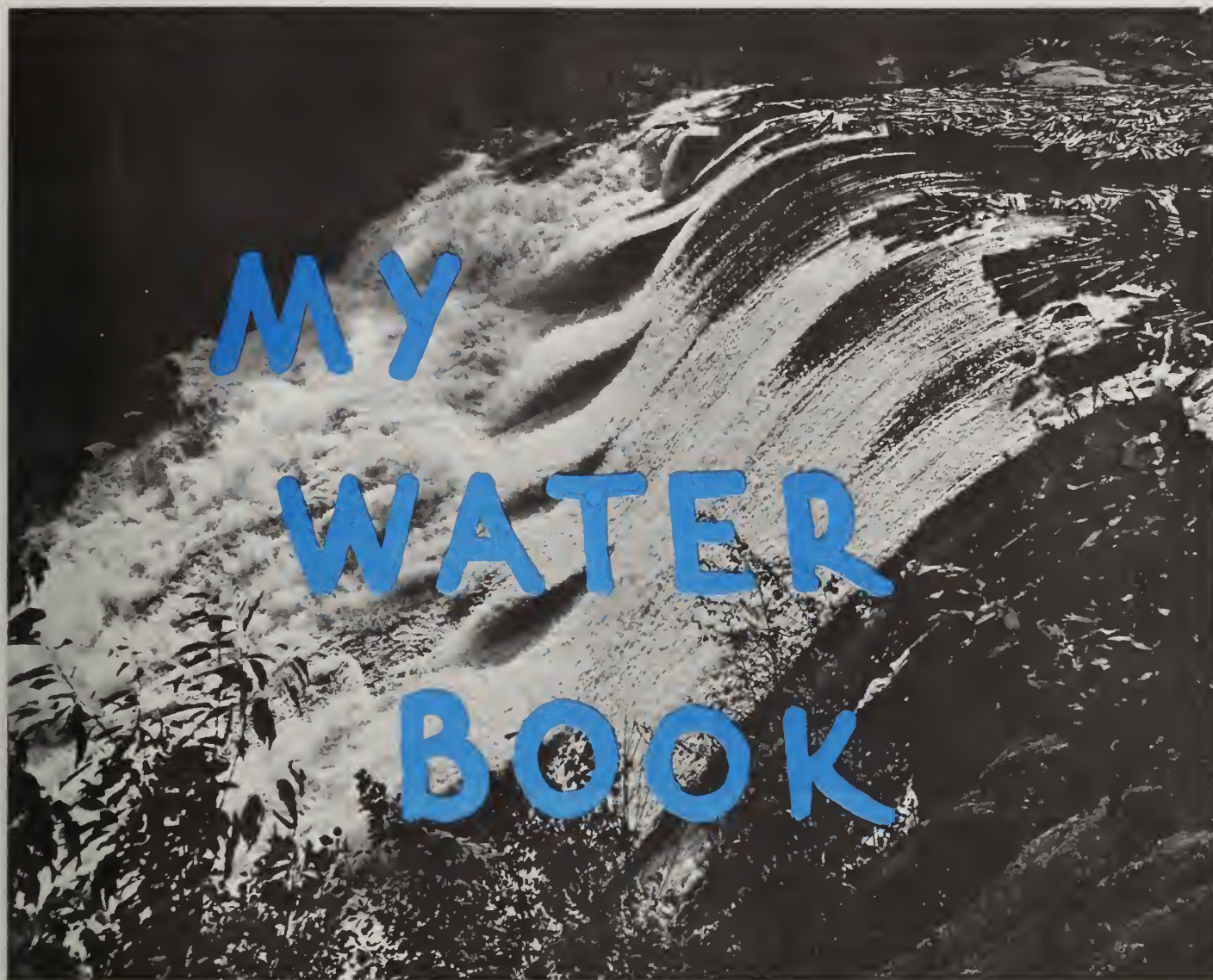
MOE  
MYW  
ANNP

c.1  
a aa

# MY WATER BOOK



Front cover by Sharon Howard  
Grade II, Sir John A. Macdonald Public School, Bay Ridges, Ont.



My Son, I admonish you  
to cherish the little waters,  
for these replenish the mighty rivers  
which nourish our thirsty land.

Samuel Woodstock



Environment Ontario  
Laboratory Library  
125 Resources Rd.  
Etobicoke, Ontario M9P 3V6  
Canada

ONTARIO MINISTRY OF THE ENVIRONMENT

# WATER:

Sea - Ocean - Lake

River - Stream - Creek

Brook - Pond - Puddle

Torrent - Shower - Drop

## WATER IS:

Wet - Damp - Moist

Steam - Rain - Drizzle

Mist - Fog - Snow

Ice - Slush - Frost

Clear - Sparkling - Dancing

Cloudy - Dirty - Muddy

Hot - Cold - Freezing

Dripping - Trickling - Flowing



my dog drinks water.



my cat drinks water.



my turtle drinks water.



my canary drinks water.



my fish drinks water.

P.S. ☹️ I drink water too...

# WITH WATER WE:

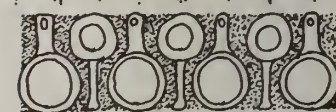
Wash ourselves



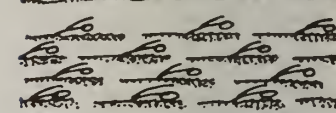
Grow food



Cook dinner



Have fun



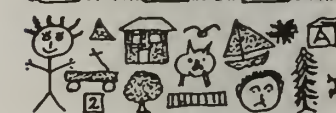
Clean windows



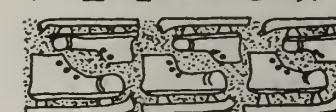
Go boating



Paint pictures



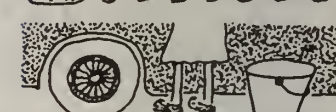
Have more fun



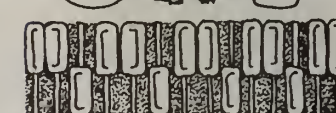
Mix lemonade



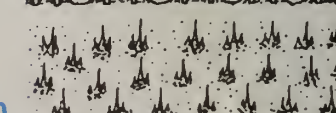
Clean the car



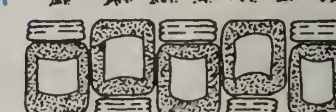
Make popsicles



Water the garden



Make paste



# The world of water

Water is a rain drop, and an ocean.

Water is a muddy puddle, and a rushing stream.

Water is a refreshing drink, and a lake like an inland sea.

Water is a funny thing.

In most places of the world you will find water. Sometimes it is all around you - as in a rain forest, where it falls from the clouds in almost solid sheets. And in other places it is hard to find - like the desert, where you might travel for days and only find a little. Often the water is not for drinking, like sea water, or the pale green pool where the frogs live. And sometimes there is just too much water, as there is each spring when the snow melts and the rivers burst their banks and the ice forms mountains in the lakes.

In Ontario we have a large amount of water, so much that thousands of lakes speckle the map of our province. Our water flows through countless streams that rush and roar amongst the rock country of the North, and flow quietly and gently between the fields and the woodlands of the South. When it rains, and the air turns misty and grey, our water washes clean the leaves and the needles of the trees. And in winter, as snow and ice, it paints all of the country white and hides the bright, gay colours of Fall.

In all this water teems a life we can only sometimes see. The fish and the frogs, the clams and the turtles are the larger creatures. But they feed on other, much smaller forms of life that also live in the water - creatures so small that a thousand might fit on a pin head.

Also mixed into the water, and invisible to our eyes, are a variety of minerals and salts that all living things need in order to grow. Iron and sulphur, calcium and potassium, dozens of mixtures that help plants develop leaves, animals grow fur, and people stay healthy.

Sometimes, though, there are things in the water that could harm us; sometimes the water is dirty, or has become mixed with a waste. Then we have to clean the water - and that is what this book is all about, how water can help us grow, and how we look after the water.



# How we use our water

Without water we could not stay alive. Almost everything we touch, and everything we eat and drink contains water. Milk is mostly water - and so are cabbages. A drink of cola or a glass of juice would taste horrible if it didn't also contain water. Even water alone tastes good when it is cold and fresh. In fact, we could live for many, many days on just water - but it's a good thing we don't have to.

Many of the hard and seemingly-dry things around you are made by adding some water to a mixture. The walls of your school may be made of bricks (which contain some moisture), meaning they are held together with a mortar mixed with water; or they may be made of concrete, which is made by adding water; or they may be of wood, which must always contain moisture if it is not to become dry and cracked. Some of the electricity that heats your stoves, lights your lamps, and makes your refrigerator work is made by using the power of water as it rushes over a falls or rapids. The ink in your pens contains water. The paint on the walls may be mixed with water. Even the polish with which you clean your shoes has just a little water mixed with the stain and the waxes and oils.

Some of the food you eat is brought to Canada in ships that sail up our rivers and through our lakes: ships that carry all kinds of goods, from automobiles to candy, and gasoline to Easter eggs.

In the fields, farmers rely on water to make their crops grow. If enough water does not come in the form of rain, then the farmer sometimes pumps water from a well or a river. This he lets run through channels cut between the rows of tomatoes or corn or cabbages or fruit trees - or he may spray it over the land and let it soak into the soil to nourish the roots of the plants and trees.



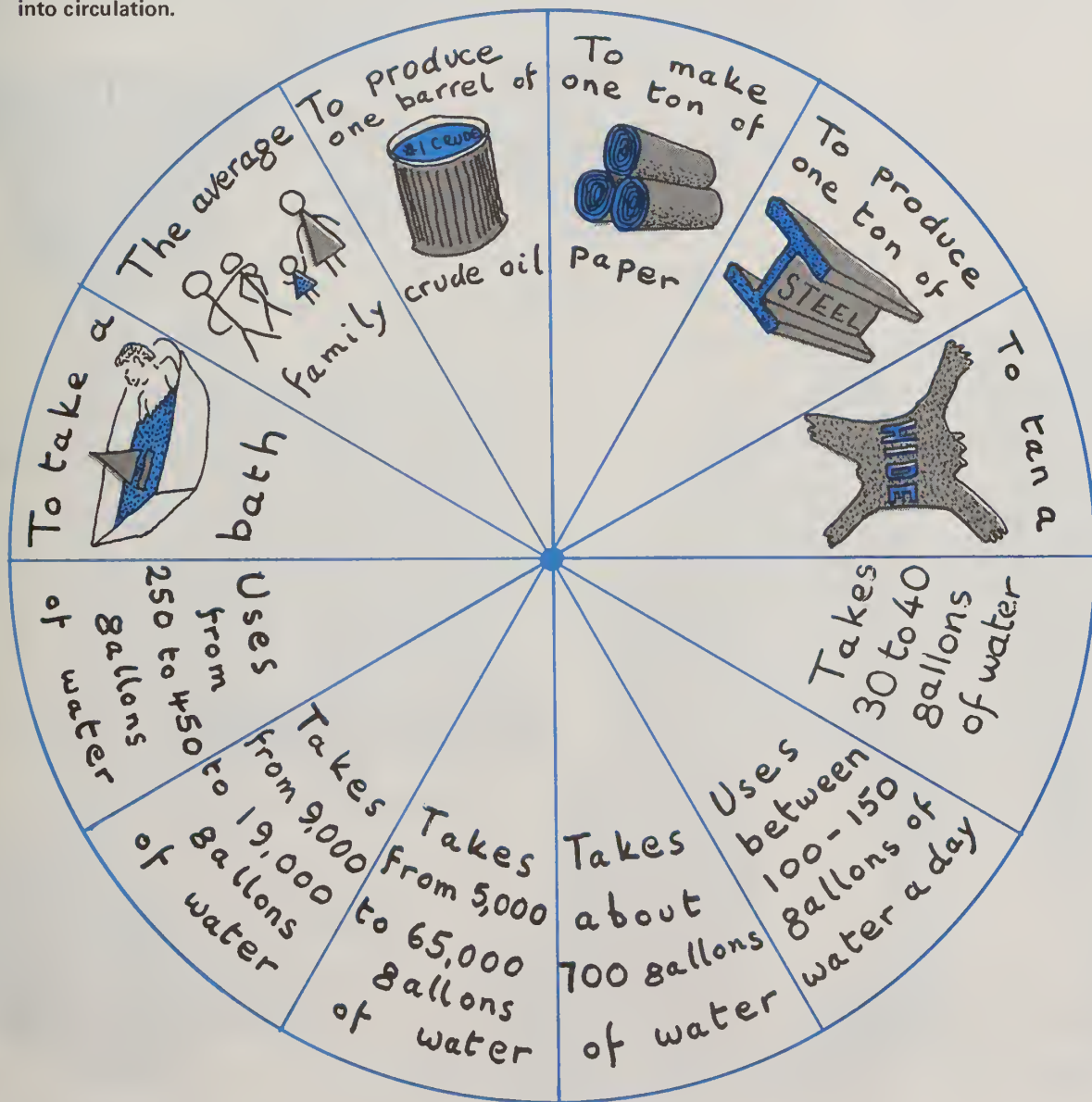
# The water we use

Each of us uses gallons and gallons of water each day: when we wash, when we cook, when we use the washroom, when we clean our houses and water the grass and make an ice rink in the back yard. In the larger cities, each person may use up to 150 gallons of water each day. In the country, where many families use private wells, each person uses about 50 gallons a day.

Industries use much more water than people. Millions of gallons of water are used each day to make things, to heat factories, and to wash products. Many industries use their water over and over again - and may have to cool it because it gets too hot, or heat it before using it again -- or even clean it of any impurities.

Most of our water, once we have used it, goes down the drain and is wasted. This water, before it is emptied into the rivers and lakes, has to be made safe so that it cannot harm any of the life forms in the fresh water into which it passes. As well, because a river or lake may serve as a source of water for many communities along its banks, the wastes returned to it must be prevented from becoming a danger to other users.

Some of the water used in factories is put into the products they make - products like face cream, soup, canned food, etc. When these products are shipped to the stores, the water goes with them. Then people buy the products and use them, and, through the body processes, the water is released and again put back into circulation.

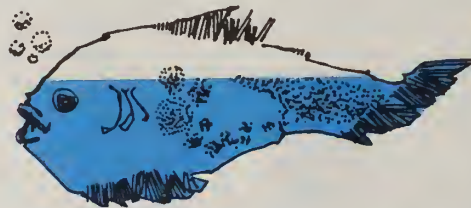
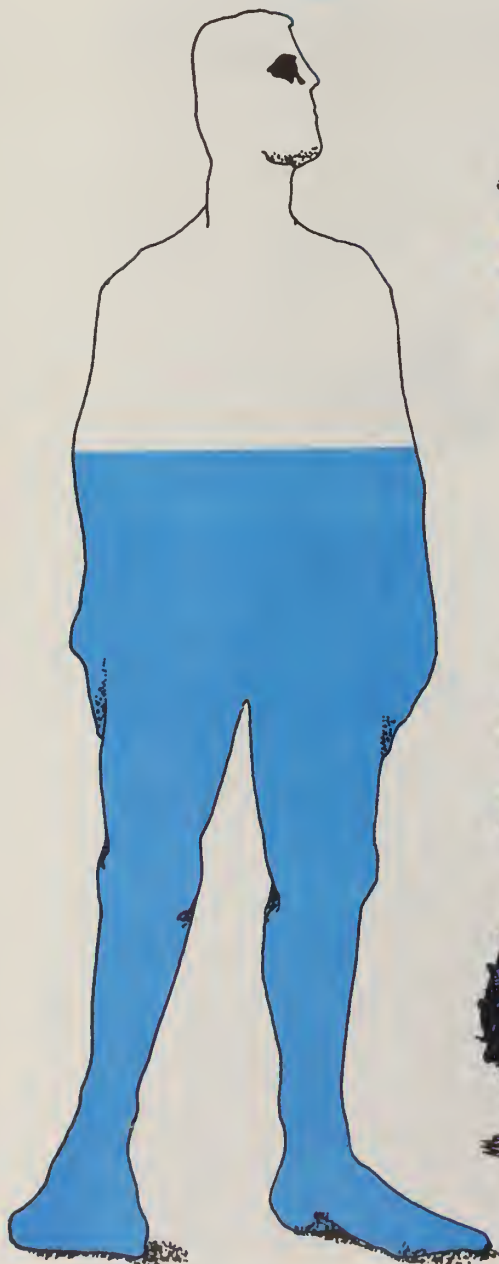


# All living things contain water

Much of what we are is water. The human body cannot exist without water; and is actually more water than anything else, between 65% and 70%. Many fruits and vegetables are mostly water - and most watery of them all are the water melon and the cucumber.

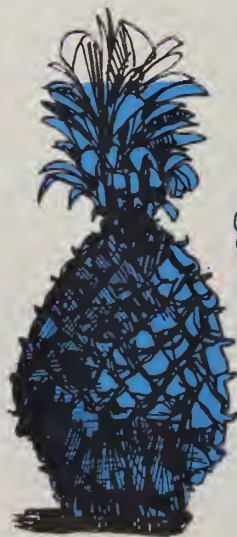
Quite a lot of the water in the human body is lost through evaporation at the surface of the skin. More is lost through the various glands that secrete fluid and keep our eyes washed and lubricated, or our mouths moist, and our noses clean. This water is replaced in the body from fluids that we drink. Excess moisture that we drink and do not need is wasted from us.

Man 65%

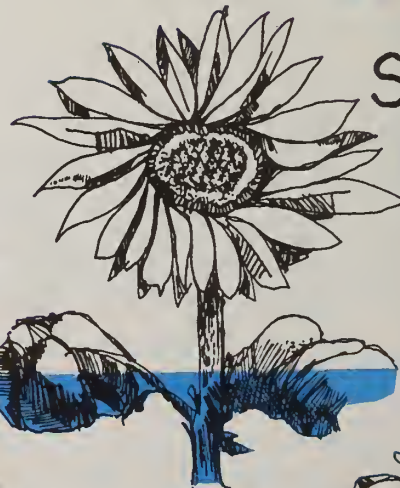


Fish 67%

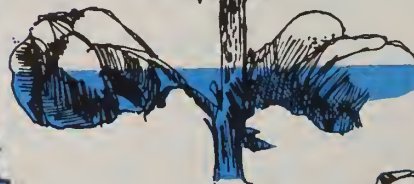
Chicken 74%



Pineapple 87%



Sunflower 5%

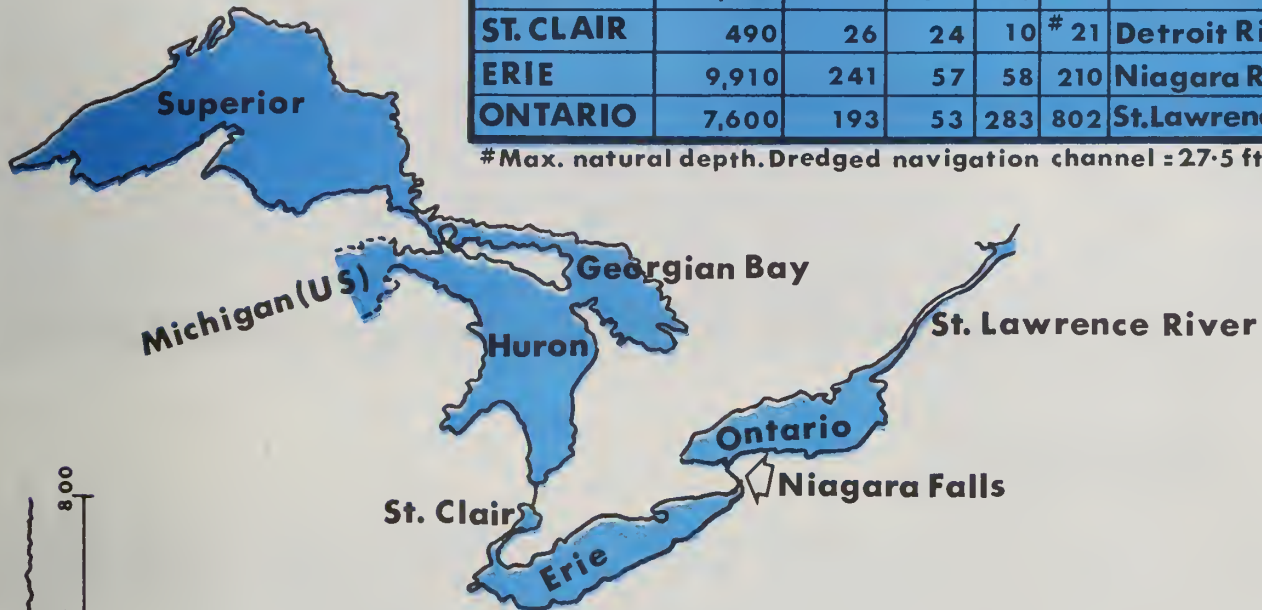


Jellyfish 95%



LAKE	Area of water surface in sq.mi.	Length in miles	Width in miles	Average and max. depth ft.		Natural Outlet
				av.	max.	
SUPERIOR	31,800	383	160	487	1333	St. Marys River
MICHIGAN	22,400	321	118	276	923	Lake Huron
HURON	23,000	247	101	195	750	St. Clair River
ST. CLAIR	490	26	24	10	# 21	Detroit River
ERIE	9,910	241	57	58	210	Niagara River
ONTARIO	7,600	193	53	283	802	St. Lawrence River

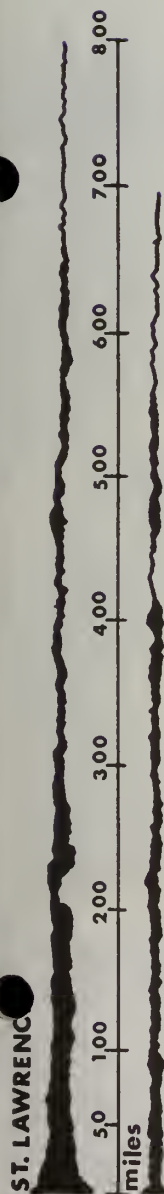
#Max. natural depth. Dredged navigation channel = 27.5 ft.



RIVER	length miles	drainage area sq.mi.
ST. LAWRENCE	800	680,000
OTTAWA	690	57,000
GRAND	180	1,049
THAMES	85	2,252
DON	27	140
ROUGE	27	41

SOME ONTARIO RIVERS

ANNUAL PRECIPITATION			
LAKE BASIN	AV."	MAX."	MIN."
SUPERIOR	29	36	23
MICHIGAN	31	37	22
HURON	31	39	26
ERIE	34	43	24
ONTARIO	34	43	28



ALL THE WATER IN ONTARIO

22,914 cu.mi.

PRECIPITATION 730 cu.mi.

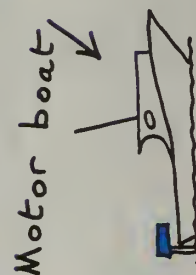
2184 LAKES (Canadian)

GROUND WATER 20000 cu.mi.

Water,  
water,  
everywhere  
water

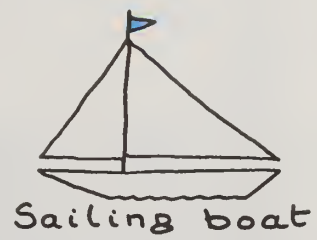


Fishing boat



House  
boat





Sailing boat



Rowing boat



# The cycle of weather

When water becomes warm it changes to vapour and evaporates - like steam from a bath. When the vapour cools down it condenses and turns back into water - like rain. In this way our water is always moving, except when it is very cold and the water turns to ice. Then it doesn't go anywhere until the sun comes out and melts it.

When rain falls, it lands on trees, rooftops, parking lots and roads, and on fields. Some even splashes into rivers and lakes and mixes with the water already there. The rain that falls onto roofs and parking lots and roads runs away into drains and is led, through pipes, to a point where it can flow into a creek or stream or river. That which lands on vegetation like trees, bushes and fields, settles on each leaf or blade of grass until several drops form together. Then the larger drops run down the shiny surface of the leaf and drop - either to another leaf, or to the ground.

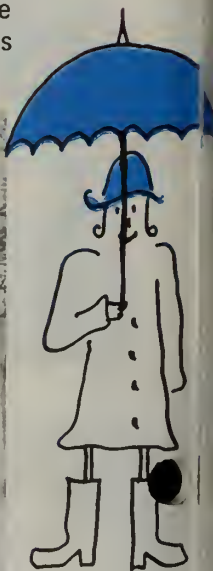
Once on the ground, the rain soaks into the soil, making its way through the tiny gaps between the particles of earth. Sooner or later as it seeps down through the soil, it will come against either a layer of rock that will not absorb moisture, or a layer of dense material, like clay, that has hardly any crevasses for the water to pass through. At this point, the water stops going down into the soil and starts to follow the direction of the layer against which it has come.

As the surface of the ground rises and falls to make valleys and hills, so the water will follow. If the layer comes close to the surface, or even breaks the surface, then the water will run from the ground forming a spring - the start of a creek or river.

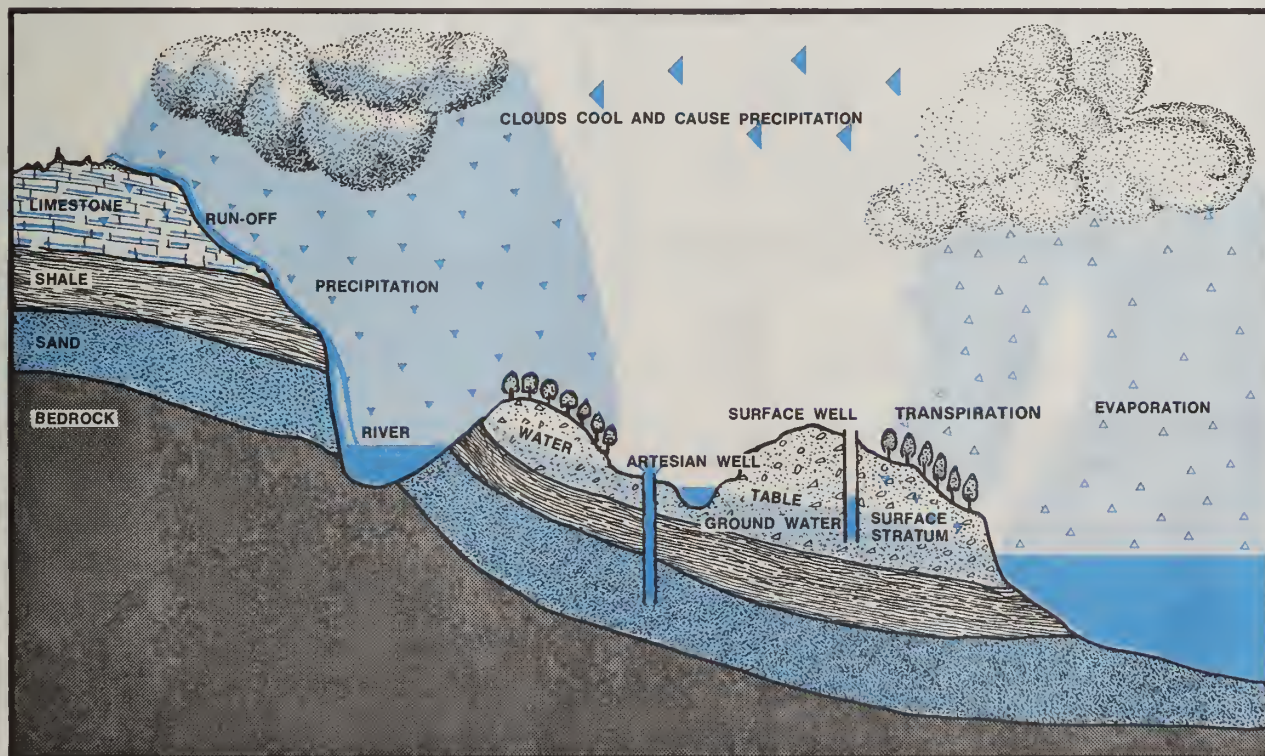
Gradually all the streams join together and form rivers, which in turn empty into a lake or the sea. From the surface of the rivers and lakes, and particularly from the surface of the sea, water vapour rises and forms the clouds. Pushed by the wind, the clouds drift and, as the land rises, try to climb over the hills. The higher they go, the cooler they get until they become so cold that the vapour turns back into water. It is raining.

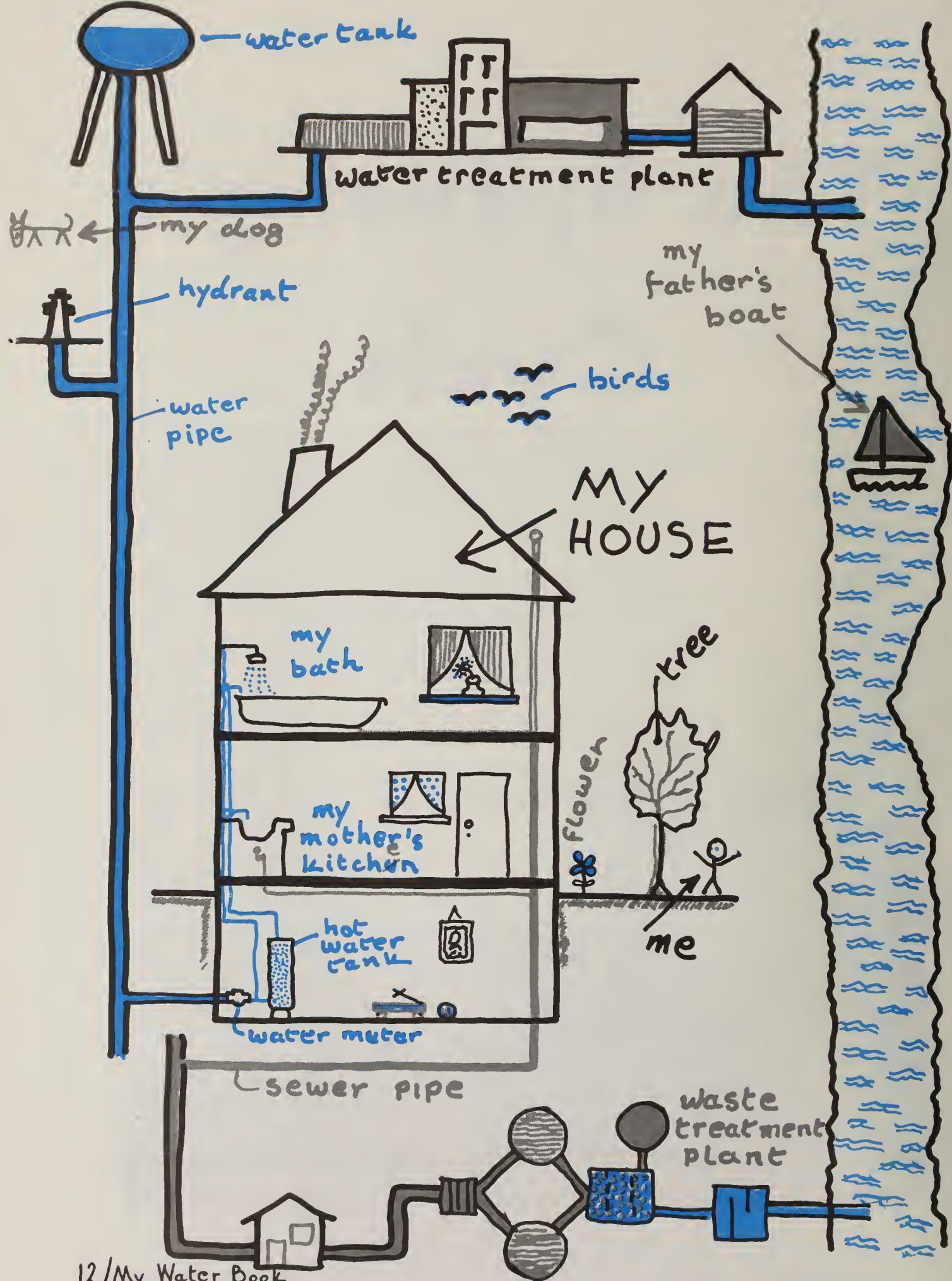
Another part of this process takes place when plants and trees take moisture from the soil and give it off as vapour through their leaves. This is called 'transpiration', and again gives water vapour back into the atmosphere.

In brief, EVAPORATION of moisture from oceans, lakes, rivers and the land, plus the TRANSPIRATION of moisture from plants, forms water vapour which in turn forms clouds. The clouds eventually return this moisture to earth as PRECIPITATION.



# The hydrologic cycle





# The water in your home

If your house is connected to a municipal water supply system, then the water that flows from the taps when you turn them on may have travelled through several miles of underground pipe to reach you, and may have been treated and conditioned in a variety of ways to make it safe for you to drink. Likewise, the water that drains away when you empty a bath or a sink, or flush a toilet, goes through another set of pipes and is treated in a pollution control plant before being discharged to your local river or lake.

Let's follow some water as it passes through a treatment plant, is pumped to your house, leaves by way of the drains, and goes back into circulation.

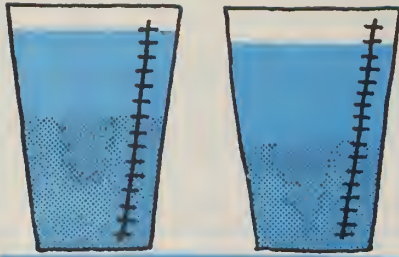
It all starts at the place where the water is drawn. This may be a deep well drilled into the strata (layer) below the ground that contains water or, more commonly, will be a river or a lake. Large pumps draw the water from this source and push it through pipes leading to the treatment plant. There, by the addition of chemicals, and by passing the water through filters and screens, the water is cleansed. Finally, it is given a dose of chlorine (klôr'één) to make sure that no harmful germs, that might still be in the water, or in the pipes it next passes through, can do any harm.

From the treatment plant the water is pumped into a distribution system - and will probably go first to a reservoir or elevated storage tank. This is to make sure that there will always be enough water available, and to equal the pressure at which the water comes out of the taps in the homes along the system.

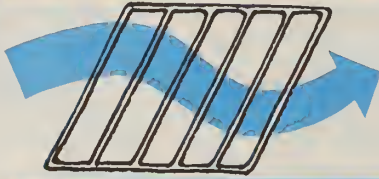
A pipe from the storage tank then threads its way beneath the streets of your community. Opposite each house, a much smaller pipe takes some of the water into the basement and passes it through a meter - so that the amount of water used can be measured. From the meter, the water is piped to each of the sinks, baths and appliances in each house.

Wastes that are discharged from your house are collected in another set of pipes and taken to the waste treatment plant in your community. There they are passed through a series of specially-designed tanks and chambers to reduce the impurities they contain to a safe level. Then, following more treatment with chlorine to kill any germs that might remain, the almost pure water is given back to the river or lake.

# How is water made safe to drink ?



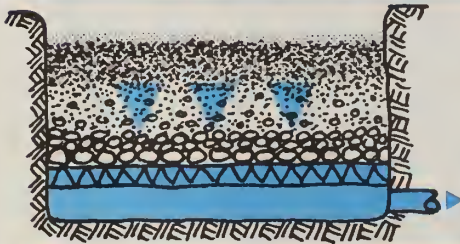
When your community accepts the responsibility of supplying you with drinking water, they have to be very sure that the water is of good quality, and is safe for you to drink. Sometimes this is not difficult - as when people live where there is a plentiful supply of clear, sweet water. Many people, however, live alongside rivers or lakes where the water is cloudy or dirty. Polluted water has to be very carefully treated before it can be supplied to people to drink.



After the water is drawn from the lake or river - or in certain areas from very deep wells - it is first passed through a grid of large metal bars that stop any pieces of wood, tree branches or large objects from entering the treatment plant.



Next, depending on the quality of the water, it may be passed to a tank - often about as big as the living room in your home - where chemicals are mixed with it. These help make the very small particles of matter in the water cling together until they become heavy enough to sink to the bottom. Here, the sludge (which is really a kind of mud) is removed and washed down the drain.



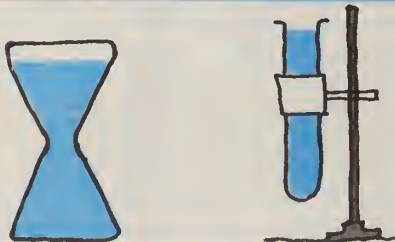
The chemicals do not remove all of the matter that might be in the water, however. In the next process, the water is passed through a filter. Here, the water is gently and slowly passed through a deep bed of sand and gravel, or other materials, which are mixed so that the holes between the grains of sand, etc., become smaller and smaller. As the water passes between the grains, the minute particles of matter are trapped and held. At the bottom of the filter, the now clean water is collected and piped to a storage tank within the plant.



With all the dirt being stopped and held in the filter, it sooner or later becomes so full of mud that no water can pass through it. When that happens, the plant operators open and close a series of valves and pump some of the clean water from the storage tank back through the filter from the bottom. This washes out all the dirt which is collected in a separate pipe and led away to the drains.



Once the clean water reaches the storage tank in the plant, it is practically ready for people to use. The last thing to be done is to kill any germs that might possibly have slipped through. This is done by adding a small amount of the chemical called chlorine. Only enough is added to kill the germs and protect the water on its way to your house.



Now the water is ready to drink. To make sure that the chlorine is still working and still protecting you, waterworks experts visit points around the distribution system and take samples of the water in the pipes. These samples are taken back to a laboratory and tested. The amount of chlorine they find is called a residual - and only a very little shows in their tests, about three parts of chlorine to every million parts of water.

# Where does all the waste water go ?

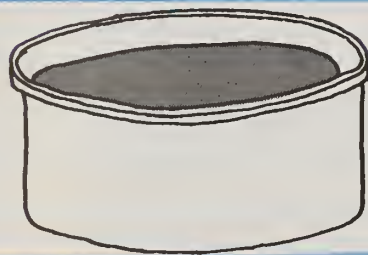
When the waste water leaves your home it is taken through a series of pipes to the municipal sewage treatment plant. On the way, the pipes collect the wastes from many other homes and factories until, by the time the main sewer reaches the treatment plant, almost as much waste water is flowing down this pipe as there is fresh water being pumped up the other pipe from the water treatment plant.



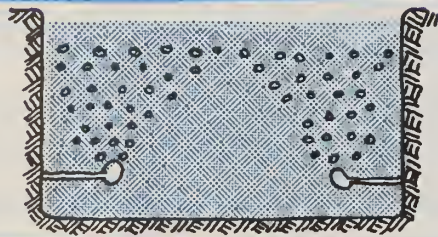
Once the wastes reach the treatment plant, work starts on making the water clean and safe again. Once more, the first stage is to pass the flow through a grid of metal bars to remove the rags and larger items of waste.



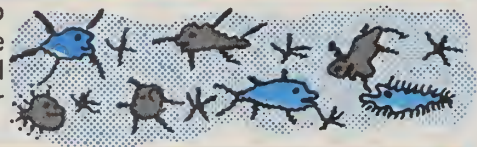
Next, the waste water flows into a tank where it is allowed to be very still - without fast movement or waves. This allows the solid matter to settle to the bottom where it forms a thick sludge - like mud. This sludge is removed by pumps to another tank where it is further treated before being trucked away as a liquid or a dry cake to be used on the land by farmers. The water in the tank, still far from pure, is allowed to overflow gently into a channel leading to the next, and very special, process.



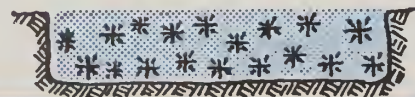
The next thing to happen to the waste water is that great quantities of air are forced through it - rather in the way you might blow bubbles in a glass of water through a drinking straw. Bubbles that form at the bottom of the tank, where the equipment is located, rise to the surface and cause the water in the tank to become thoroughly mixed. In another system, a machine like a giant mix-master stirs the surface of the water and mixes the wastes in the tank.



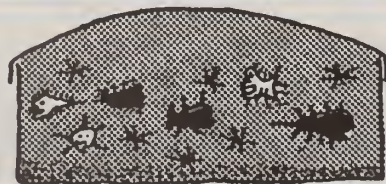
The air that is forced through the water helps a special type of bacteria to grow and work at destroying the bad things that are still in the waste. These 'bugs' help us to make the water safe, and could not live if we did not feed them enough air. When the water leaves this tank, having been there for several hours, it is beginning to look quite clean.



But, it's not yet ready to be put back into the lake or river. It still has some very small pieces of waste mixed with it - pieces that are almost too small to see. To remove them, the waste is once again put into a tank and allowed to remain very quiet and still. As before, the small pieces settle to the bottom and are removed, and the now clear water overflows from the top. Having been given a dose of chlorine to kill any remaining germs, this water drains away to the river or lake and merges with the other water.



All that is now left to do is to treat the sludge that has been pumped away from the bottom of the two tanks where the water is kept still and quiet. The sludge is kept in large, circular tanks that are tightly closed. Here, where there is no oxygen, a different type of bacteria go to work for us and make the sludge safe so that it can be used by the farmers to condition the soil of their fields.





Ontario

In the Province of Ontario, problems of water supply and pollution control are looked after by the Ministry of the Environment.

The Ministry of the Environment is the official agency responsible for the development, use, treatment and management of water resources, including the provision of adequate pollution control measures throughout the province. In certain instances, it controls water-taking through a permit system. A similar system limits the use of chemicals to control aquatic nuisances.

The Ministry supervises the operation of all water, sewage and other waste treatment plants in the province, and provides technical assistance in this regard. It has the right to enforce any of its proposals concerning water supply and pollution control to individuals, industries, or municipalities.

In its work, the Ministry advises municipalities concerning water treatment and waste disposal requirements, reviews plans, and approves all proposed projects.

Further, the Ministry constructs water and waste treatment facilities, and can enter into direct agreements with municipalities under a variety of arrangements.

Area pipelines can be constructed to supply whole regions where water may be in short supply - with the water being available to the communities along the route.

The Ministry has many programs involving water supply and pollution control. It surveys and measures the quantity of water in Ontario and assesses its quality, with particular emphasis on the Great Lakes.

Published by  
Information Services Branch  
135 St. Clair Avenue West  
Toronto, Ontario M4V 1P5

Ministry of the Environment

Hon. J.A.C. Auld  
Minister

Everett Biggs  
Deputy Minister

DATE DUE		

MOE/MYW/ANNP  
 Ontario Ministry of the En  
 My water book  
 annp  
 c.1 a aa

MOE/MYW/ANNP  
 Ontario Ministry of the En  
 My water book  
 annp  
 c.1 a aa



*Environment Ontario*  
 Laboratory Library  
 125 Resources Rd.  
 Etobicoke, Ontario M9P 3V6  
 Canada



(9250)  
 MOE/MYW/ANNP



Ontario

Ministry  
of the  
Environment